Monetary policy – Group Homework #1

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Dynamic IS-LM model and COVID-19.

Consider the following IS-LM dynamic model.

$$\begin{cases} \Delta y(t) = \frac{1}{\rho_y}[-b_0 i(t-1) + g + A + a_s(t-1) - (1-c_0)y(t-1)] \\ \Delta i(t) = \frac{1}{\rho_i}[y(t-1) - \beta i(t-1) - m] \end{cases}$$

Note that the current changes in the level of production and the interest rate depend on the net excess of demand observed in the previous period.

Calibrate the model assuming: $b_0 = 2.5$, $c_0 = 0.7$, $\beta = 3$, $A = 10$, $m = 0.7$, $g = 0.4$, $\rho_y = 7$, $\rho_i = 5$, and consider a permanent negative demand shock [the lockdown inhibits consumption expenditures], i.e., $a_s(0) = 1$ and $a_s(t) = 1.05$ for $t > 0$.

Questions:

(i) Write a dynare code that simulates the shock and plots the IRFs.
(ii) Comment on the adjustment dynamics in the $y(t)$-$i(t)$ space.

Tips.

- The shock is deterministic; you need to use the command `simul(periods=1000)`, before you must correctly write the dynare-shock block.
- The model is linear; you thus do not need to write the steady state.
- Consider a shock -0.05 in the shock block, you should fix the shock to -0.05 for 1:1000 (the initial value of the shock is automatically set at 0). Now is $a_s = 1 + shock$.
- Assuming that you call the interest rate `r` and the output `y` in your dynare code, to plot the adjustment process, you need to type: `plot(y(1:300), r(1:300))`.

Note. All simulation results from your dynare code (after you run it) are stored in a structure array. To call it, you must type `oo_`. A **structure array** is a data type that groups related data using data containers called fields. Each field can contain any data. Access data in a field using dot notation of the form structName.fieldName. On Matlab prompt, type for help: `help struct`.